Chapter Four
ENVIRONMENTAL CONSEQUENCES

This chapter describes the potential environmental consequences associated with the No Action Alternative and Proposed Action Alternative in accordance with FAA Order 1050.1E. A total of 21 impact categories are addressed. Potential impacts are evaluated by comparing the projected future conditions of the affected environment due to the Proposed Action with the corresponding future conditions due to the No Action Alternative.

4.1 NOISE

Aircraft noise is often the most noticeable environmental effect associated with aviation projects. In this section, noise exposure levels attributable to aircraft operations in the No Action Alternative and Proposed Action Alternative are presented and compared. The analysis includes determination of aircraft noise exposure in the Environmental Study Area as forecasted for the years 2006 and 2011. As described in Appendix H, noise that is sufficiently loud or frequent in occurrence may interfere with various human activities and/or be considered non-compatible with noise sensitive land uses.

Chapter Three describes existing (i.e., 2004) noise exposure levels in the Environmental Study Area. In this chapter, future noise exposure levels associated with the No Action and Proposed Action Alternatives are described and compared for the purpose of determining if a significant impact may result from implementation of the Proposed Action. This analysis shows how noise exposure levels will change in future years for both the No Action and Proposed Action Alternatives.

If approved, the Proposed Action is expected to be implemented sometime in 2006. Aircraft noise modeling was therefore completed for 2006 and five years later, in 2011. Note that in 2006, CLE will not have fully completed the runway extension and shift for Runway 06R/24L. However, construction is expected to be complete by 2011; thus, 2011 was one of the years evaluated. The noise analysis incorporates use of the full length of the extended Runway 06R/24L in 2011.

4.1.1 Noise Modeling Methodology

As discussed in Section 3.2.1.1, the FAA has developed specific guidance and requirements for the assessment of aircraft noise in order to comply with NEPA requirements. This guidance, described in FAA Order 1050.1E, requires that aircraft noise be analyzed in terms of the DNL metric.

The noise modeling methodology described in Section 3.2.1.1 and **Appendix I** is used for the 2006 and 2011 noise analysis. As discussed in these sections, detailed information on aircraft operations within the Environmental Study Area is assembled for input into NIRS. This includes average annual daily flight schedules, flight tracks, and runway use for the future years. For a given year, the No Action Alternative and Proposed Action have the same flight schedule. The change in noise exposure is evaluated due to the proposed changes in aircraft routings in the Proposed Action

versus the existing routings in the No Action Alternative.

Average daily flight schedules were developed for 2006 and 2011, as discussed in **Appendix D**. The flight schedules are used to supply arrival and departure times, aircraft types, and origin/destination information. Aircraft type information is used for estimating performance and noise characteristics for each flight while the origin/designation data are used to predict aircraft weight at departure.

Modeled flight tracks (i.e., the path and direction the aircraft fly) are based on radar data collected during the existing condition (i.e., 2004) analysis and collaboration with ATC. Flight tracks for the No Action Alternative are the same as used in the existing condition analysis, except for CLE in the year 2011 when the on-going construction of the Runway 06R/24L extension and shift will be completed. For the Proposed Action, modeled flight tracks were developed from the alternative tracks created by the airspace design team using the Terminal Area Route Generation Evaluation Traffic and Simulation (TARGETS) program.

Projections of future runway and routing (i.e., flight track) use are needed to model noise exposure with the Proposed Action. Aircraft routings are defined by a series of fixes that guide a flight from one airport to another. For CLE and DTW, the use of specific routings from an airport was determined during discussions with the airspace design team. At CLE and DTW, the origin/destination determines the initial fix (and thus the route, or flight track) which will typically be used for a specific flight. The location of the initial fix for a route determines the primary runway that will normally be used by a flight.

DNL levels were calculated for the 173,242 census blocks and over 4,000 noise sensitive locations within the Environmental Study Area. In addition, DNL levels were calculated at grid points covering parks and an evenly spaced grid of 125,000 points throughout the Environmental Study Area.

4.1.2 Noise Impact Criteria

The FAA has defined the threshold levels above which aircraft noise causes a significant adverse impact on people. In residential areas, 65 DNL is the threshold above which aircraft noise exposure levels are considered to be non-compatible.[1] A significant impact is defined as an increase of 1.5 DNL at a noise-sensitive land use within the 65 DNL.[2]

In 1990, the FAA issued a noise screening procedure to evaluate whether certain airspace actions above 3,000 feet AGL might increase DNL levels by 5 dB or more. The procedure served as a response to FAA experience that increases in noise of 5 DNL or more at cumulative levels well below 65 DNL could be disturbing to people and become a source of public concern. In 1992, the Federal Interagency Committee on Noise (FICON) recommended that in instances where there are increases of 1.5 DNL or more at noise-sensitive locations at or above 65 DNL, noise increases of 3 DNL or more between 60 and 65 DNL should be evaluated. Increases of 3 DNL below 65 DNL are not "significant impacts" but are to receive consideration in the environmental documentation. FAA has adopted FICONs recommendation in FAA Order 1050.1E. The Order also stipulates that 45 DNL is the minimum level at which noise exposure is evaluated for ATC actions that incorporate more than one airport, as ambient noise levels can easily exceed this level.

For the purpose of this EA, increases of 1.5 DNL that result in a 65 or higher DNL affecting noise sensitive land uses are considered to be in excess of the thresholds of significance identified in FAA Order 1050.1E, Appendix A, Section 14. Increases of 3 DNL between 60 and 65 DNL are considered "slight to moderate impacts" as are increases of 5 DNL or greater at levels between 45 DNL to 60 DNL. The increase in noise at these levels is enough to be potentially noticeable and disturbing to some people, but the cumulative noise level is not sufficient to exceed the thresholds of significance. **Table 4-1** summarizes the criteria used to assess the impact of change in noise exposure attributable to the Proposed Action as compared to the No Action Alternative.

4.1.3 Aircraft Noise Impact Analysis

Based upon the noise methodology described in Section 4.1.1 and the noise impact criteria described in Section 4.1.2, the noise analysis was conducted to evaluate noise exposure levels using the applicable thresholds of significance, for the Proposed Action as compared to the No Action Alternative.

Figures 4-1 and 4-2 show calculated noise exposure levels in 2006 with the existing airspace structure and routings. As shown in **Table 4-2**, approximately 16,400 people within the Environmental Study Area are expected to be exposed to noise levels of 65 DNL and greater due to aircraft noise in 2006, if no changes to the existing airspace are made. By 2011, despite an increase in operations at numerous airports, it is estimated that the population exposed to noise levels at or above 65 DNL will decrease to approximately 13,500 persons. This decrease is due to changes in the aircraft fleet mix from 2006 to 2011 and the increasing use of quieter aircraft. The number of people exposed to 45 DNL or higher also decreases from 2006 to 2011.

Figures 4-3 through 4-7 show the change in aircraft noise exposure levels with the Proposed Action as compared to the No Action Alternative. The color coding used on these figures to identify the change in noise exposure level is defined in **Table 4-3**. **Tables 4-4 and 4-5** identify the primary reasons for the DNL changes in 2006 and 2011, respectively, that are shown in **Figures 4-3 through 4-7**. A designator has been assigned to each change area for ease in associating the data in the tables with the figures.

Relative to the noise exposure for year 2004 operations, the population exposed to aircraft noise of 65 DNL or higher would be less for the No Action Alternative in the years 2006 and 2011.

In both years of analysis, changes in noise exposure level resulting from implementation of the Proposed Action would not exceed the applicable thresholds of significance. Note that in 2011, there are two census blocks with a 1.5 DNL change in the 65 DNL. However, neither change area occurs over a noise sensitive land use nor is there any affected population. Accordingly, the change in noise exposure does not exceed the threshold of significance.

Table 4-2 shows the population potentially exposed to various noise levels for the Proposed Action for 2006 and 2011. **Table 4-6** presents a comparison of the population exposed to noise levels for the Proposed Action versus the No Action Alternative. In comparison to the No Action Alternative, the population exposed to noise levels at or above 45 DNL does increase with the Proposed Action. However, the population exposure to DNL levels at or above 65 dB decreases with the Proposed Action.

Specifically, the population experiencing noise exposure levels of 65 DNL or higher would decrease by 0.7% and 0.9% in 2006 and 2011, respectively, with implementation of the Proposed Action.

Based upon this analysis, there would be no increase in noise exposure levels in excess of the applicable thresholds of significance due to the Proposed Action or the No Action Alternative. Accordingly, no further evaluation of noise is required.

Table 4-1

Criteria for Determining Impact of Increases in Aircraft Noise

DNL Noise Exposure with Proposed Action	Minimum Increase in DNL with Proposed Action	Change in Noise Exposure Level	Reference
65 DNL or higher	1.5 DNL	Exceeds Threshold of Significance	FAA Order 1050.1E, Apdx. A, §14.3 14 CFR Part 150.21(2)(d) FICON 1992
60 to 65 DNL	3.0 DNL	Slight to Moderate Affect	FAA Order 1050.1E, Apdx A, §14.4c FICON 1992
45 to 60 DNL	5.0 DNL	Slight to Moderate Affect	FAA Order 1050.1E, Apdx A, §14.5e FAA Notice 7210.360

Sources: As noted.

Table 4-2

Future Potential Population Exposed to Aircraft Noise

Year of Analysis/Noise Exposure Level	Population		
	No Action Alternative	Proposed Action	Change
2006			
45 to 60 DNL	1,766,615	1,820,948	3.1%
60 to 65 DNL	45,734	47,192	3.2%
>=65 DNL	16,404	16,288	-0.7%
Total above 45 DNL	1,828,753	1,884,428	3.0%
2011			
45 to 60 DNL	1,542,827	1,586,632	2.8%
60 to 65 DNL	40,991	42,507	3.7%
>=65 DNL	13,501	13,378	-0.9%
Total above 45 DNL	1,597,319	1,642,517	2.8%

Source: Metron Aviation Inc., and HNTB.

Table 4-3

Color Coding for Change in Noise Exposure Levels

Color	DNL Noise Exposure with Proposed Action	Minimum Change in DNL With Proposed Action	Change in Noise Exposure Level
Noise Increase			
Yellow	45 to 60 DNL	>=5.0 DNL Increase	Slight to Moderate Affect
Orange	60 to 65 DNL	>=3.0 DNL Increase	Slight to Moderate Affect
Red	65 DNL or higher	>=1.5 DNL Increase	Exceeds Threshold of Significance
Pink	65 DNL or higher	<1.5 DNL Increase	Newly Non-Compatible
Noise Decrease			
Purple	45 to 60 DNL	>=5.0 DNL Decrease	Slightly to Moderately Relieved
Blue	60 to 65 DNL	>=3.0 DNL Decrease	Slightly to Moderately Relieved
Dark Green	65 DNL or higher	>=1.5 DNL Decrease	Substantially Relieved
Light Green	<65 DNL	<1.5 DNL Decrease	Newly Compatible

Sources: NIRS Users Guide.

Table 4-4

Reason for Change in Aircraft Noise Exposure for Year 2006 Proposed Action

Area of Change (See Figures 4-3, 4-4, and 4-5)		Population (number of Census Blocks)							
		06-A	06-B	06-C	06-D	06-E	06-F	06-G	Total
Noise Exposure Increase									
Exceeds Threshold of Significance	Red	-	-	-	-	-	-	-	0 (0)
Slightly to Moderately Affected	Orange	-	-	-	-	-	-	-	0 (0)
Slightly to Moderately Affected	Yellow	-	-	-	-	-	-	-	0 (0)
Newly Non-Compatible	Pink	17 (1)	19 (2)	0	41 (1)	0	34 (4)	0 (1)	111 (9)
Total Increase		17 (1)	19 (2)	0 (0)	41 (1)	0 (0)	34 (4)	0 (1)	111 (9)
Noise Exposure Decrease									
Substantially Relieved	Dark Green	-	-	-	-	-	-	-	0 (0)
Slightly to Moderately Relieved	Purple	-	-	-	-	-	-	-	0(0)
Slightly to Moderately Relieved	Blue	-	-	-	-	-	-	-	0 (0)
Newly Compatible	Light Green	0	0	227 (3)	-	0 (4)	-	-	227 (7)
Total Decrease		0 (0)	0 (0)	227 (3)	0 (0)	0 (4)	0 (0)	0 (0)	227 (7)
Net Change (Increase minus Decrease)		**17 (1)**	**19 (2)**	**-227 (3)**	**41 (1)**	**0 (4)**	**34 (4)**	**1 (1)**	**-116 (2)**

Primary Reason for Change	
06-A	Increase of CLE Runway 24R departures, based on MASE fix assignments related to the use of the inboard/outboard runways.
06-B	Increase of CLE Runway 06L daytime departures, based on MASE fix assignments related to the use of the inboard/outboard runways.
06-C	Decrease of CLE Runway 24R arrivals, based on MASE fix assignments related to the use of the inboard/outboard runways.
06-D	Increase of CLE Runway 24L nighttime arrivals, based on MASE fix assignments related to the use of the inboard/outboard runways.
06-E	Decrease of CLE Runway 06L departures departing to the south. This is due to MFD becoming an arrival fix and the traffic in the alternative turning north towards AMRST and OBRLN.
06-F	Increase in DTW Runway 04R departures. This is based on MASE fix assignments with an increase of traffic to MOONN and SCORR.
06-G	Increase in arrival traffic to PTK due to new arrival fix for DTW satellite airports.

Source: Metron Aviation, Inc analysis.

Table 4-5

Reason for Change in Aircraft Noise Exposure for Year 2011 Proposed Action

Area of Change (See Figures 4-3, 4-4, and 4-5)		Population (number of Census Blocks)						
		11-A	11-B	11-C	11-D	11-E	11-F	Total
Noise Exposure Increase								
Exceeds Threshold of Significance	Red	0 (1)	0 (1)	-	-	-	-	0 (2)
Slightly to Moderately Affected	Orange	-	-	-	-	-	-	0 (0)
Slightly to Moderately Affected	Yellow	-	-	-	-	-	-	0 (0)
Newly Non-Compatible	Pink	19 (2)	3 (1)	0	29 (1)	0	0	51 (4)
Total Increase		19 (3)	3 (2)	0 (0)	29 (1)	0 (0)	0 (0)	51 (6)
Noise Exposure Decrease								
Substantially Relieved	Dark Green	-	-	-	-	-	-	0 (0)
Slightly to Moderately Relieved	Purple	-	-	-	-	-	-	0 (0)
Slightly to Moderately Relieved	Blue	-	-	-	-	-	-	0 (0)
Newly Compatible	Light Green	-	-	105 (1)	-	22 (1)	47 (1)	174 (3)
Total Decrease		0 (0)	0 (0)	105 (1)	0 (0)	22 (1)	47 (1)	174 (3)
Net Change (Increase minus Decrease)		**19 (3)**	**3 (2)**	**- 105 (1)**	**0 (1)**	**-22 (1)**	**-47 (1)**	**-123 (3)**

Primary Reason for Change	
11-A	Increase of CLE Runway 06R daytime departures and 24R nighttime departures, based on MASE fix assignments related to the use of the inboard/outboard runways.
11-B	Increase of CLE Runway 24R departures and Runway 06R daytime departures, based on MASE fix assignments related to the use of the inboard/outboard runways.
11-C	Decrease of CLE Runway 24R arrivals, based on MASE fix assignments related to the use of the inboard/outboard runways.
11-D	Increase of DTW Runway 03L nighttime departures, based on MASE fix assignments related to the use of MOONN and SCORR
11-E	Decrease of DTW Runway 04L and 04R nighttime departures to the east.
11-F	Decrease of DTW Runway 04R departures to the east.

Source: Metron Aviation, Inc analysis.

Midwest Airspace Enhancement EA
Figure 4-1 : No Action Alternative
2006 Noise Exposure

Map Legend

- < 45 DNL
- >= 45 < 50 DNL
- >= 50 < 55 DNL
- >= 55 < 60 DNL
- >= 60 < 65 DNL
- >= 65 < 70 DNL
- >= 70 < 75 DNL
- >= 75 DNL
- Water
- Study Area Boundary
- Limited Access Highway
- Highway
- Airport

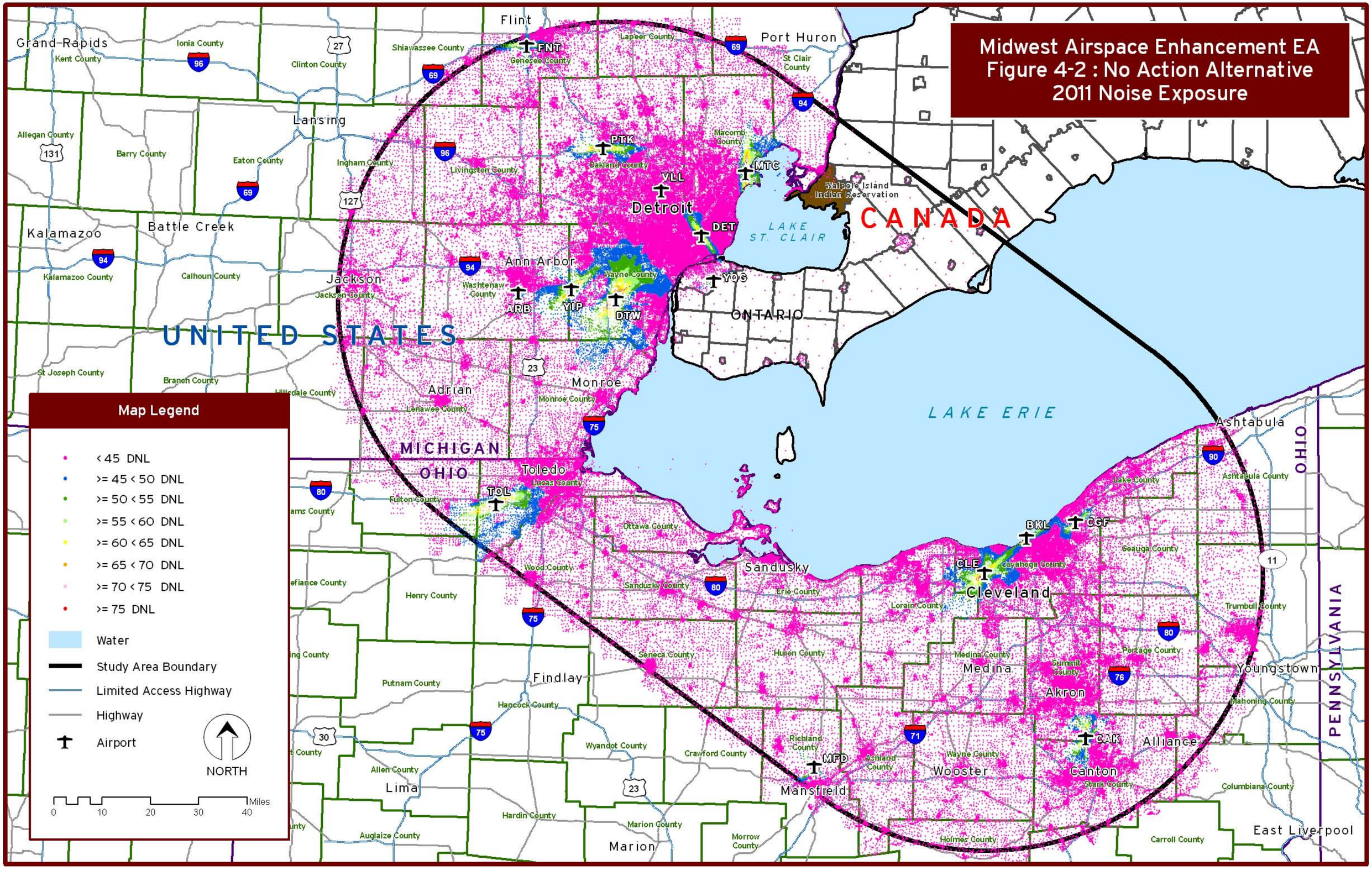
NORTH

0 10 20 30 40 Miles

Grand Rapids
Kent County
Ionia County
Clinton County
Shiawassee County
Flint
Genesee County
Lapeer County
Port Huron
St Clair County
Lansing
Allegan County
Barry County
Eaton County
Ingham County
Livingston County
Oakland County
Macomb County
Detroit
Walpole Island Indian Reservation
CANADA
LAKE ST. CLAIR
Kalamazoo
Battle Creek
Kalamazoo County
Calhoun County
Jackson
Jackson County
Washtenaw County
Ann Arbor
Wayne County
ONTARIO
UNITED STATES
St Joseph County
Branch County
Hillsdale County
Adrian
Lenawee County
Monroe
Monroe County
LAKE ERIE
MICHIGAN
OHIO
Toledo
Lucas County
Fulton County
Ottawa County
Wood County
Sandusky
Sandusky County
Erie County
Lorain County
Cleveland
Cuyahoga County
Lake County
Ashtabula
Ashtabula County
Geauga County
Trumbull County
PENNSYLVANIA
Henry County
Seneca County
Huron County
Medina
Medina County
Summit County
Akron
Portage County
Youngstown
Mahoning County
Putnam County
Findlay
Hancock County
Wyandot County
Crawford County
Richland County
Ashland County
Wayne County
Wooster
Mansfield
Canton
Stark County
Alliance
Columbiana County
Allen County
Lima
Hardin County
Auglaize County
Marion County
Marion
Morrow County
Holmes County
Carroll County
East Liverpool

PTK VLL MTC DET FNT YOS ARB YIP DTW TOL BKL CGF CLE MFD CAK

Midwest Airspace Enhancement EA
Figure 4-2 : No Action Alternative
2011 Noise Exposure



Midwest Airspace Enhancement EA
Figure 4-3 : 2006 Change In Noise Exposure - CLE

06-A

06-B

06-C

06-D

06-E

71

480

480

71

Map Legend

Noise Increases	Resulting In	Color
>= 5.0+ DNL	45-60 DNL	
>= 3.0+ DNL	60-65 DNL	
>= 1.5+ DNL	>= 65 DNL	
< 1.5+ DNL	>= 65 DNL	

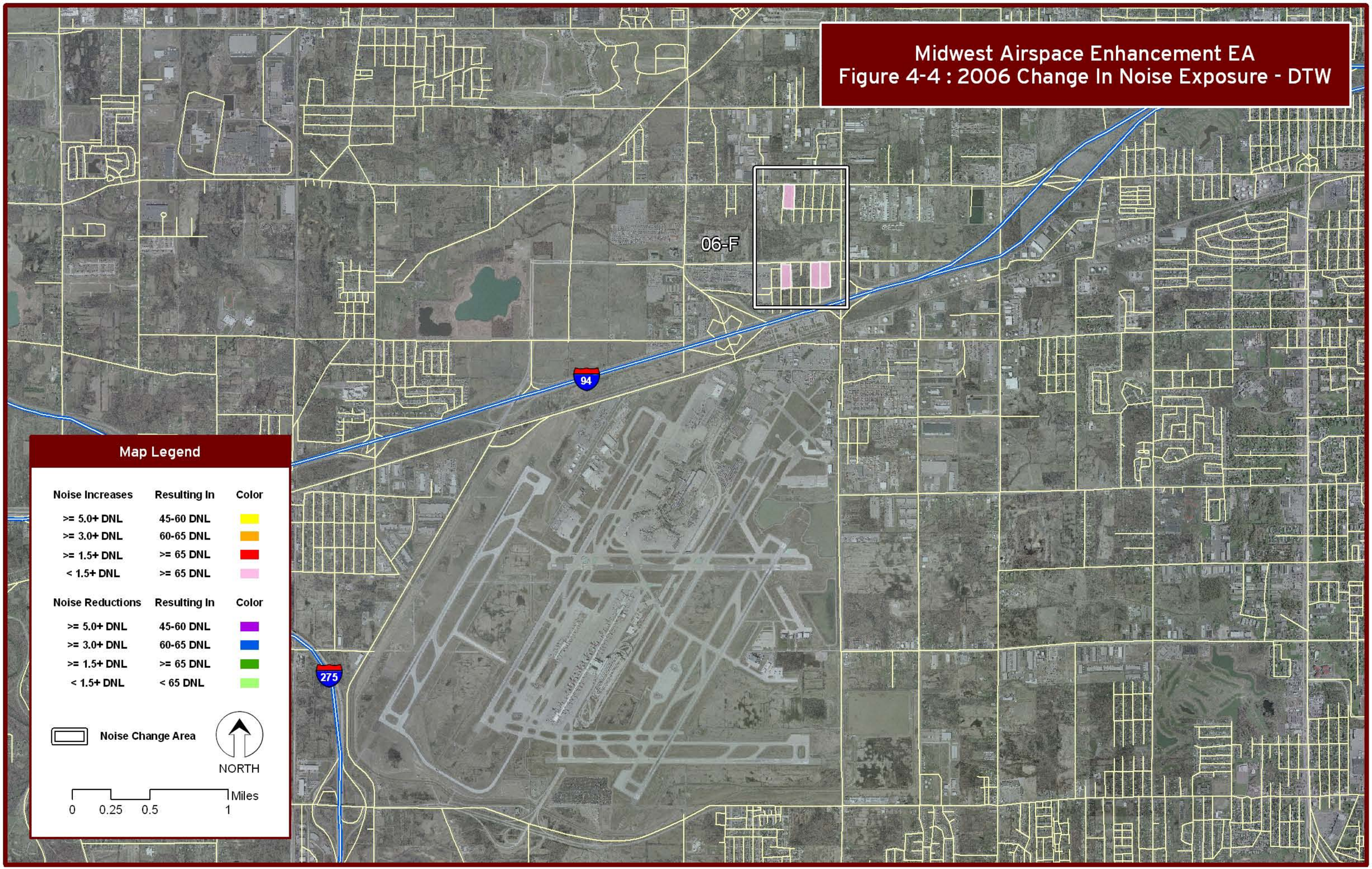
Noise Reductions	Resulting In	Color
>= 5.0+ DNL	45-60 DNL	
>= 3.0+ DNL	60-65 DNL	
>= 1.5+ DNL	>= 65 DNL	
< 1.5+ DNL	< 65 DNL	

Noise Change Area

NORTH

0 0.25 0.5 1 Miles

Midwest Airspace Enhancement EA
Figure 4-4 : 2006 Change In Noise Exposure - DTW



Map Legend

Noise Increases	Resulting In	Color
>= 5.0+ DNL	45-60 DNL	
>= 3.0+ DNL	60-65 DNL	
>= 1.5+ DNL	>= 65 DNL	
< 1.5+ DNL	>= 65 DNL	

Noise Reductions	Resulting In	Color
>= 5.0+ DNL	45-60 DNL	
>= 3.0+ DNL	60-65 DNL	
>= 1.5+ DNL	>= 65 DNL	
< 1.5+ DNL	< 65 DNL	

Noise Change Area

NORTH

0 0.25 0.5 1 Miles

Midwest Airspace Enhancement EA
Figure 4-5 : 2006 Change In Noise Exposure - PTK

06-G

59

59

Map Legend

Noise Increases	Resulting In	Color
>= 5.0+ DNL	45-60 DNL	
>= 3.0+ DNL	60-65 DNL	
>= 1.5+ DNL	>= 65 DNL	
< 1.5+ DNL	>= 65 DNL	

Noise Reductions	Resulting In	Color
>= 5.0+ DNL	45-60 DNL	
>= 3.0+ DNL	60-65 DNL	
>= 1.5+ DNL	>= 65 DNL	
< 1.5+ DNL	< 65 DNL	

Noise Change Area

NORTH

0 0.125 0.25 0.5 Miles

Midwest Airspace Enhancement EA
Figure 4-6 : 2011 Change In Noise Exposure - CLE

11-A

11-B

11-C

71

480

480

71

Map Legend

Noise Increases	Resulting In	Color
>= 5.0+ DNL	45-60 DNL	
>= 3.0+ DNL	60-65 DNL	
>= 1.5+ DNL	>= 65 DNL	
< 1.5+ DNL	>= 65 DNL	

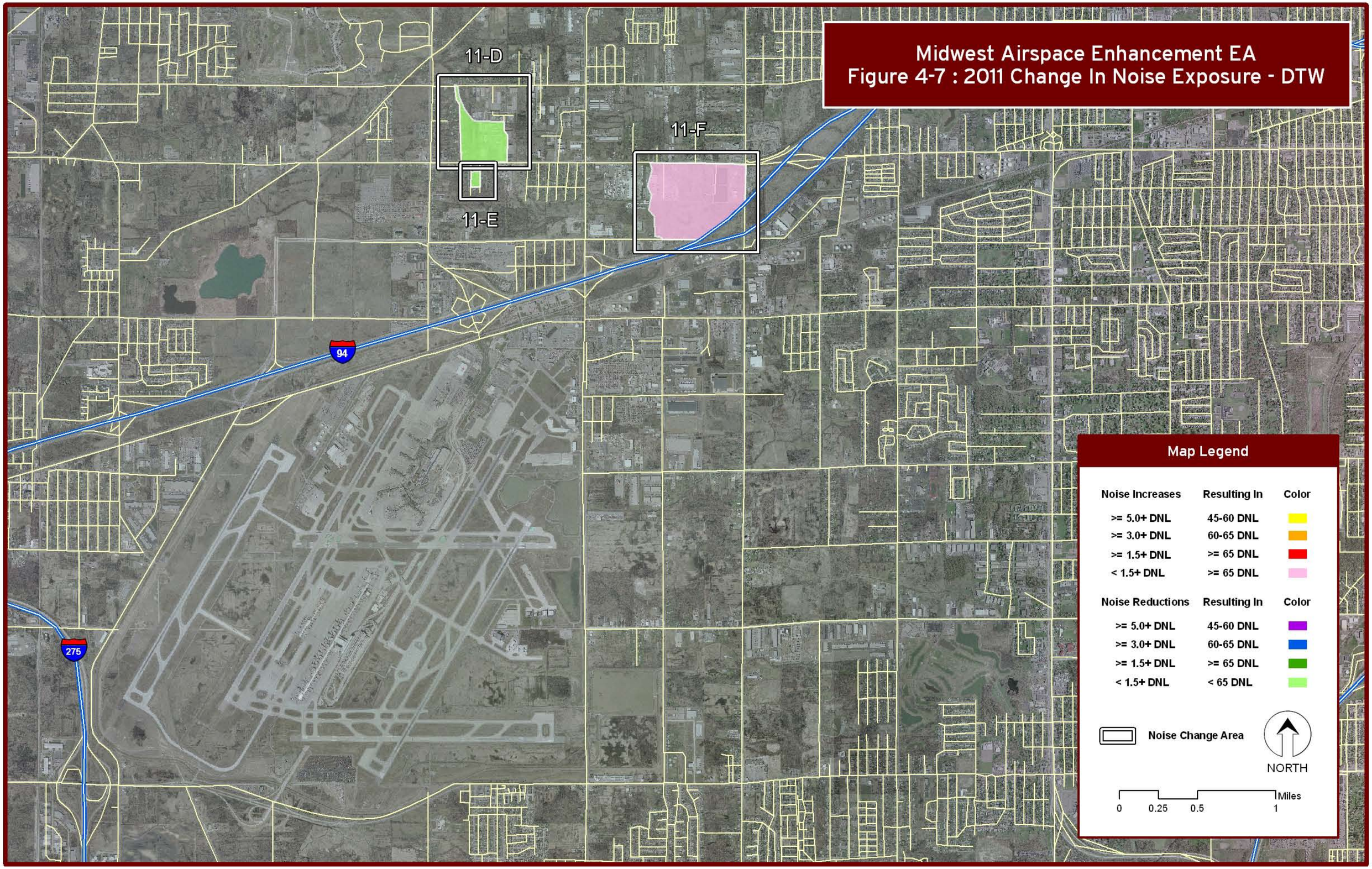
Noise Reductions	Resulting In	Color
>= 5.0+ DNL	45-60 DNL	
>= 3.0+ DNL	60-65 DNL	
>= 1.5+ DNL	>= 65 DNL	
< 1.5+ DNL	< 65 DNL	

Noise Change Area

NORTH

0 0.25 0.5 1 Miles

Midwest Airspace Enhancement EA
Figure 4-7 : 2011 Change In Noise Exposure - DTW



Map Legend

Noise Increases	Resulting In	Color
>= 5.0+ DNL	45-60 DNL	
>= 3.0+ DNL	60-65 DNL	
>= 1.5+ DNL	>= 65 DNL	
< 1.5+ DNL	>= 65 DNL	

Noise Reductions	Resulting In	Color
>= 5.0+ DNL	45-60 DNL	
>= 3.0+ DNL	60-65 DNL	
>= 1.5+ DNL	>= 65 DNL	
< 1.5+ DNL	< 65 DNL	

Noise Change Area

NORTH

0 0.25 0.5 1 Miles

Table 4-6

Potential Population Change - Modification to Existing Airspace Alternative

2006	No Action Alternative					Proposed Action Total
Proposed Action	DNL (dBA)	<45	45 to <60	60 to <65	>=65	
	<45	8,293,392	42,605	0	0	8,335,997
	45 to <60	98,280	1,721,974	694	0	1,820,948
	60 to <65	0	2,036	44,929	227	47,192
	>=65	0	0	111	16,177	16,288
No Action Total		8,391,672	1,766,615	45,734	16,404	**10,220,425**

2011	No Action Alternative					Proposed Action Total
Proposed Action	DNL (dBA)	<45	45 to <60	60 to <65	>=65	
	<45	8,618,568	51,573	0	0	8,670,141
	45 to <60	96,771	1,489,195	666	0	1,586,632
	60 to <65	0	2,059	40,274	174	42,507
	>=65	0	0	51	13,327	13,378
No Action Total		8,715,339	1,542,827	40,991	13,501	**10,312,658**
Key to Change in Noise Exposure		Increase		No Change		Decrease

Source: NIRS Analysis; Metron Aviation Inc. and HNTB.

4.2 COMPATIBLE LAND USE

The compatibility of existing and planned land uses with aircraft operations is usually determined based on the extent of noise impacts around an airport.

As described in Section 4.1, neither the No Action Alternative nor the Proposed Action Alternative would result in changes in noise exposure levels in excess of the applicable thresholds of significance. Moreover, the Proposed Action would reduce non-compatible land uses within the 65 DNL (as measured by the number of people at or above this noise exposure level) as compared to the No Action Alternative. Therefore, there are no impacts to compatible land uses which would exceed the threshold of significance defined in FAA Order 1050.1E, Appendix A, Section 4, and no further analysis is required.

4.3 SOCIOECONOMIC IMPACTS

According to FAA Order 1050.1E, the proposed ATC routing changes with the Proposed Action should be evaluated for their potential to result in the relocation of residences and businesses, alter surface transportation patterns, divide established communities, disrupt orderly planned development, or to create an appreciable change in employment. Neither the No Action Alternative nor the Proposed Action Alternative involves any construction of

physical facilities or change in noise exposure levels in excess of the applicable thresholds of significance. There would be no acquisition of real estate, no relocation of residents or community businesses, no disruption of local traffic patterns, no loss in community tax base, and no changes to the fabric of the community. Accordingly, there would be no socioeconomic impacts and no further analysis is required.

4.4 ENVIRONMENTAL JUSTICE

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations," and the accompanying Presidential Memorandum and DOT Order 5610.2, "Environmental Justice in Minority and Low-Income Populations," requires the FAA to consider environmental justice impacts in an EA. In evaluating environmental justice impacts, FAA seeks to identify and address disproportionately high and adverse human health or environmental impacts on low-income and minority populations in the communities potentially impacted by the No Action Alternative or the Proposed Action Alternative. There are no adverse human health or environmental effects associated with the Proposed Action (including the noise, air quality, water quality, hazardous materials, and cultural resource categories), which would exceed applicable thresholds of significance. There are no impacts from the Proposed Action which would affect low income or minority populations at a disproportionately higher level than it would other population segments. Accordingly, there would be no significant environmental justice impacts and no further analysis is required.

4.5 CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

As described in FAA Order 1050.1E, FAA is required to identify and assess environmental health and safety risks that the agency has reason to believe could disproportionately affect children. In proportion to their size, children breathe more air, drink more water and eat more food than adults. This puts them at greater risk of exposure to pollutants. Children's bodies are also less able to metabolize, detoxify and expunge these pollutants. There are no impacts associated with the Proposed Action (including the noise, air quality, water quality, hazardous materials, and cultural resource categories) which would exceed applicable thresholds of significance. The Proposed Action would not affect products or substances that a child is likely to come into contact with, ingest, use, or be exposed to, and would not result in environmental health and safety risks that could disproportionately affect children. Accordingly, there would be no significant impacts related to children's environmental health and safety risks. No further analysis is required.

4.6 SECONDARY/INDUCED IMPACTS

Major development proposals have the potential to produce induced or secondary impacts on surrounding communities. Induced impacts could include shifts in population and growth; increased (or decreased) demand for public services; and changes in business and economic activity within the confines of the Environmental Study Area.

Significant induced impacts normally result from significant impacts to other impact categories, especially noise, compatible land

use and social impacts; as discussed in this chapter, there are no impacts associated with the Proposed Action in excess of the applicable thresholds of significance for these impact categories. Moreover, the Proposed Action does not involve major development, and would not be expected to result in shifts in population and growth, increased demand for public services, or changes in business and economic activity. Therefore, there would be no potential for secondary or induced impacts and no further analysis is required.

4.7 PARKS/DEPARTMENT OF TRANSPORTATION 4(F)

Section 4(f) of the Department of Transportation Act of 1966[3] provides protection to specific types of publicly-owned land from "use" by transportation agencies unless there is no feasible and prudent alternative to the use of that land, and unless the project is planned so that impacts resulting from use of the land are minimized. These lands include public parks, recreation areas, wildlife and waterfowl refuges, and historic sites. Section 4(f) resources within the Environmental Study Area are described in Section 3.2.3.

In regard to Section 4(f) properties the term use encompasses both direct and indirect impacts. *Direct use* is the physical taking of the Section 4(f) properties. The Proposed Action does not require land acquisition or facility construction. Therefore, the Proposed Action does not result in a direct use of any Section 4(f) property.

Adverse *indirect impacts* including noise may constitute a "constructive use" of a Section 4(f) property. In determining whether there is a "constructive use" the FAA must determine if the impacts would substantially impair the property. A Section 4(f) property is determined to be substantially impaired when the activities, features, or attributes of the site that contribute to its significance or enjoyment are substantially diminished. According to FAA Order 1050.1E, the Part 150 land use compatibility guidelines may be used to determine if there is a constructive use of a Section 4(f) property, if the guidelines are relevant to the value, significance, and enjoyment of that particular property.

Constructive use of Section 4(f) properties was evaluated as part of the noise modeling analysis (see Section 4.1). Specifically, noise exposure levels were calculated for grid points at 1,000 foot intervals throughout Section 4(f) properties. For section 4(f) properties that were not covered by the 1,000-foot grid interval (i.e., smaller parks and monuments), noise exposure was calculated as a single points located in the center of the park. There are no Section 4(f) properties that would experience a change in noise exposure level in excess of the applicable threshold of significance (i.e., a 1.5 DNL change resulting in a noise exposure level greater than or equal to 65 DNL). In addition, there are no Section 4(f) properties located within census blocks designated as 'newly non-compatible' as described in **Tables 4-4 and 4-5**. Based upon this analysis, there are no impacts to Section 4(f) properties in excess of the threshold of significance defined in FAA Order 1050.1E, Appendix A, Section 6, and no further analysis is required.

4.8 HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Archaeological and historic architectural resources that will be affected by Federally funded and licensed undertakings come

under the protection of the National Historic Preservation Act.[4] Section 106 of this Act requires Federal agencies to consider the effects of such undertakings on properties listed, or eligible for listing, in the National Register of Historic Places. An adverse effect is considered to be one that diminishes the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.[5] If a determination of adverse impact is made, the consultation procedures of the Advisory Council on Historic Preservation must be followed.

A variety of historic resources are in the Environmental Study Area as discussed in Section 3.2.4 and shown in **Figure 3-11**.

Primary impacts include the removal or alteration of historic resources. There would be no ground disturbance as a result of the Proposed Action. Therefore, there would be no direct impacts on properties listed on or eligible to be listed on the National Register of Historic Places.

Secondary or indirect impacts include changes in noise, vehicular traffic, light emissions, or other changes that could interfere substantially with the use or character of the resource. Indirect impacts include noise impacts that would diminish the integrity of the property's setting.

As the Proposed Action involves changes to aircraft flight routes, the resulting changes to noise exposure levels were assessed for potential noise impacts to historic resources within Environmental Study Area. Specifically, noise exposure levels were calculated for the historic resources shown in **Figure 3-11**. There are no historic resources that would experience a change in noise exposure level in excess of the applicable threshold of significance (i.e., a 1.5 DNL change resulting in a noise exposure level greater than or equal to 65 DNL). In addition, there are no historic resources located within census blocks designated as 'newly non-compatible' as described in **Tables 4-4 and 4-5**. There are no adverse affects on any of the historic resources within the Environmental Study Area. Based upon this analysis, there are no impacts to historic resources in excess of the threshold of significance defined in FAA Order 1050.1E, Appendix A, Section 11, and no further analysis is required.

4.9 FISH, WILDLIFE, AND PLANTS

This resource category includes consideration of impacts to fish, wildlife, and plants, including migratory birds.

4.9.1 Species other than Migratory Birds

Potential impacts to fish, wildlife, and plants were evaluated in accordance with FAA Order 1050.1E. A significant impact would occur if the Proposed Action would jeopardize the continued existence of federally listed threatened or endangered species or result in the destruction or adverse modification of critical habitat for any species. Impacts were also considered in accordance with Executive Order 13112, "Invasive Species." Impacts considered are those that could prevent the introduction, provide for the control, and minimize the economic, ecological, and human health impacts that are caused by invasive species.

The Proposed Action involves ATC routing changes for airborne aircraft. Thus, it will not destroy or modify critical habitat for any species. Additionally, no species that meets the definition of an invasive species will be introduced in the project area due to the Proposed Action. Therefore, there are no significant impacts to fish, non-avian wildlife, and plants which would exceed the

threshold of significance defined in FAA Order 1050.1E, Appendix A, Section 8. The analysis therefore focuses on the potential impacts of the Proposed Action on the migratory patterns of birds in the Environmental Study Area rather than potential impacts to terrestrial or marine species.

4.9.2 Migratory Birds

The following sections discuss migratory bird flyways, strike factors, and impact assessment.

4.9.2.1 Spatial and Temporal Aspects of the Flyways

Migratory bird patterns are discussed in Section 3.2.6.2. The Atlantic Flyway pertinent to this study is one of several migratory bird flyways that have been identified in the Western Hemisphere. These flyways can be explained as distinct flow patterns that adhere to a defined geographic area. These well-defined and proven patterns are made up of the thousands of individual routes used by migrating bird species to travel from breeding grounds to winter quarters. There are several in the Western Hemisphere, with the Atlantic Flyway pertinent to the Environmental Study Area.

The actual routes followed by many migratory birds vary by such variables as distance traveled, time of starting, flight speed, geographic position and latitude of the breeding, and wintering grounds. The most frequently traveled migration routes conform very closely to major topographical features that lie in the general north-south movement of migratory bird flyways. Therefore, the lanes of heavier concentration along the Atlantic Flyway follow the coasts, mountain ranges and principal river valleys.

A critical part of these journeys are "stopovers" where migrating birds stop to feed, rest, and gather energy needed to finish the migration. Depending on distance to travel and timing with regard to season and breeding cycles, these stopover areas may support millions of birds for short to extended periods of time. Typical stopover habitat includes the coastal or estuarine beaches, salt and freshwater marshes, and mudflats.

4.9.2.2 Bird Strike Factors

Commercial air traffic has increased concurrently with an extremely successful period of wildlife management in North America. Habitat preservation and aggressive species management have contributed to increases in the populations of many avian species, particularly migratory birds which utilize available habitat in and adjacent to airports with increasing frequency. These concurrent increases in air traffic and avian populations contribute to an increased probability of bird strikes.

The multi-agency Bird Strike Committee USA reports that over 4,300 bird strikes were reported by the US Air Force in 2003. Over 5,900 bird strikes were reported for US civil aircraft in 2003. An estimated 80% of bird strikes to US civil aircraft go unreported. Approximately 90% of all bird strikes in the US are by species federally protected under the Migratory Bird Treaty Act.[6]

Three important factors have contributed to the increase in overall numbers of bird strikes. First, jet travel has replaced noisier and slower piston-powered aircraft in commercial uses which has increased bird strike probabilities. Second, natural habitat attractive to these avian species is typically abundant around airports, which are often located away from extreme urban centers

and/or near shorelines and estuaries near water. Third, air traffic has steadily increased which leads to more bird strikes.

The FAA reports that 42% of wildlife strikes occur during the approach phase, 3% during en-route phase, 39% during takeoff and climb, and 16% during landing roll.[7] As shown in **Table 4-7**, approximately 30,875 bird strikes were reported to the FAA from 1990 to 2003. About 73% of the bird strikes occurred when aircraft were at altitudes of less than 500 feet AGL, with 93% occurring under 3,500 feet AGL. Overall, the study indicates that the incidence of bird strikes declined consistently by 31% for every 1,000 foot increase in altitude, from 501 to 20,500 feet. In addition, for strikes that resulted in substantial damage to the aircraft, 67% occurred at or less than 500 feet and 28% at between 501 to 3,500 feet. This is an indication that management programs to reduce strikes should focus on the immediate vicinity of airports.

Table 4-8 shows bird species that are particularly susceptible to strikes with aircraft, including altitude at the time of known collisions. This analysis confirms that management programs to reduce bird strikes should focus on the airport environment; that is, the first 500 feet of airspace used by aircraft and the adjacent habitat encompassing that 500 feet of airspace. Furthermore, the months of July to November, and especially August, are the months in which management efforts to disperse birds away from airports should be the most intense because these months have the highest strike rates below 500 feet. With large numbers of recently fledged (young) birds, populations of most North American bird species are at their highest levels in late summer.

4.9.2.3 Impact Assessment

As stated previously, the potential hazards from the simultaneous use of airspace by both birds and aircraft is a function of several factors: (1) the relative abundance of bird habitat adjacent to or in the proximity of airports, (2) the increased abundance of migratory birds resulting from successful management, (3) the increased pressure from the growing volume of air traffic, and (4) the difficult task of redesigning airspace within the primary impact zone of 500 feet or less.

Table 4-7

Altitude and Number of Bird Strikes

Height of Aircraft	Number of Reported Strikes (% of total)	Percent (number) of Strikes causing Substantial Damage to Aircraft
0-500 feet AGL	22,606 (73%)	4.1% (928)
501-3,500 feet AGL	6,076 (20%)	6.4% (389)
>3,500 feet AGL	2,193 (7%)	3.1% (68)
Total	30,875 (100%)	4.5% (1,385)

Source: Richard A. Dolbeer, Height Distribution of Birds as Recorded by Collisions with Civil Aircraft (Unpublished manuscript), 2004, USDA Wildlife Services.

Table 4-8

Bird Species Groups Reported Struck by Civil Aircraft in USA

Species Group	Height (feet) AGL			
	0-500	501-3,500	>3,500	Total
Gulls/Terns	3,366	417	40	3,823
Passerines	3,399	322	51	3,772
Waterfowl	994	561	149	1,704
Pigeons/Doves	1,546	59	4	1,609
Raptors	895	131	19	1,043
Other known birds	1,299	272	19	1,590
Unknown birds	11,107	4,316	1,911	17,334
Total	22,606	6,076	2,193	30,875

Source: Richard A. Dolbeer, Height Distribution of Birds as Recorded by Collisions with Civil Aircraft (Unpublished manuscript), 2004, USDA Wildlife Services.

Wherever there is an interface of habitat and the airport environment, the probability of collisions increase, particularly where habitat is near a runway. As the primary bird strike zone is at altitudes of 500 feet AGL and lower, the flights paths in the immediate vicinity of an airport are of critical importance to this analysis.

Neither the No Action Alternative nor the Proposed Action Alternative would change the basic aircraft flight patterns in the immediate vicinity of any airport. With both the No Action Alternative and the Proposed Action Alternative, impacts to various bird categories would be expected to continue but not necessarily increase. Since most bird strikes take place on or near airport property, mortality to birds from aircraft would be expected to continue as a component of a much larger mortality equation nationwide. Airports within the Environmental Study Area have implemented wildlife management plans that offer specific guidelines with regard to minimizing bird strike risk in the airport environment. The Proposed Action is not expected to exacerbate that risk above past levels as long as these plans continue to be implemented consistently.

4.10 LIGHT EMISSIONS AND VISUAL IMPACTS

This impact category considers potential impacts due to light emissions and visual impacts associated with the No Action Alternative and Proposed Action Alternative, per FAA Order 1050.1E.

4.10.1 Light Emissions

The FAA considers the potential for light emissions impact the extent to which any lighting associated with an action will create an annoyance among people or interfere with their normal activities.

The lights associated with aircraft operating at higher altitudes potentially changed by the Proposed Action routes would not be bright enough to be an annoyance to people or interfere with normal activities on the ground. Proposed airspace changes at lower altitudes are predominantly near the primary airports. Radar data indicates that all areas near these airports are likely exposed to aircraft lights. The No Action Alternative will not change aircraft flight patterns and the operational increases compared to the existing conditions will be moderate.

Therefore, neither the No Action Alternative nor the Proposed Action Alternative would likely result in noticeable changes in light emissions to people on the ground. Therefore, no impacts relating to light emissions are anticipated and further analysis is not required.

4.10.2 Visual Impacts

Visual, or aesthetic, impacts are inherently more difficult to define because of the subjectivity involved. Aesthetic impacts deal more broadly with the extent that proposed development contrasts with the existing environment and whether the community's jurisdictional agency considers this contrast objectionable. Visual impacts are normally related to the disturbance of the aesthetic integrity of an area caused by development, construction, or demolition, and, thus, do not typically apply to airspace changes.

The Proposed Action would not result in the development, construction, or demolition of facilities. Neither the No Action Alternative nor the Proposed Action Alternative would change the basic aircraft flight patterns in the immediate vicinity of any airport; as a result, the changes would not result in a visual contrast with the existing environment near airports in the Environmental Study Area. Additionally the proposed airspace changes at higher altitudes are normally not visually intrusive because of the distance from the ground. Therefore, there would be no visual impacts.

4.11 AIR QUALITY

The Environmental Protection Agency (EPA) lists actions that are *de minimis* (i.e., actions expected to cause little or no increase in emissions) and thus do not require an applicable analysis under the General Conformity Rule.[8] EPA states in the preamble to this regulation that it believes, "ATC activities and adopting approach, departure, and en route procedures for air operations" are illustrative of *de minimis* actions. Qualitatively, reduction of delay and more efficient flight routings would serve to reduce fuel burn and thereby reduce air pollutant emissions.

In terms of air quality impacts related to vehicle emissions, neither the No Action Alternative nor the Proposed Action Alternative would induce changes to vehicular traffic. Aircraft operations and vehicular traffic would grow with or without the proposed ATC routing changes. In addition, the implementation of the Proposed Action would not significantly alter the distribution of vehicular traffic among the airports because the ATC routing changes would not likely change airline service trends and/or air passenger preferences on use of an airport. Air passengers traditionally select an airport based on the ticket cost, airport location, and service to a desired destination.

Since the Proposed Action would be considered a *de minimis* action and would have a negligible affect on vehicle traffic, no negative air quality impacts would be expected. Therefore, there is no potential for air quality impacts from the Proposed Action which could exceed the threshold of significance defined in FAA Order 1050.1E, Appendix A, Section 2, and further analysis is not required.

4.12 NATURAL RESOURCES AND ENERGY SUPPLY

FAA Order 1050.1E requires that the Proposed Action be examined to identify any proposed major changes in stationary facilities and/or the movement of aircraft and ground vehicles that would have a

measurable effect on local supplies of energy or natural resources.[9]

Neither the No Action Alternative nor the Proposed Action Alternative would result in the construction of facilities that would potentially impact known sources of minerals or energy.

The proposed changes in ATC routings are intended to improve air traffic flow and enhance the safe operation of aircraft within the airspace structure. The proposed ATC routings would result in more direct routings and less delay. Therefore, as compared to the No Action Alternative, the Proposed Action would result in reduced fuel consumption.

The alternatives would not result in the depletion of local supplies of energy and/or natural resources and no further analysis is required.

4.13 CONSTRUCTION IMPACTS

The implementation of changes to ATC routes does not involve any construction activity. Therefore, there would be no construction impacts associated with the No Action Alternative or the Proposed Action Alternative and no further analysis is required.

4.14 FARMLANDS

The Farmland Protection Policy Acts of 1980 and 1995 require identification of proposed actions that would affect any soils classified as prime and unique. Prime farmland contains soil that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is available for these uses. Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops.

Neither the No Action Alternative nor the Proposed Action Alternative would result in the development of facilities. Therefore, no prime and/or unique farmland soils would be impacted and further analysis is not required.

4.15 COASTAL RESOURCES

This impact category includes consideration of both coastal zone management and coastal barriers.

The Coastal Zone Management Act encourages states to preserve, protect, develop, and, where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. A unique feature of the Coastal Zone Management Act is that participation by states is voluntary. To encourage states to participate, the act makes Federal financial assistance available to any coastal state or territory that is willing to develop and implement a comprehensive coastal management program.

The Coastal Barrier Resources Act of 1982 and the Coastal Barrier Improvement Act of 1990 were created to minimize the loss of human life, protect coastal resources, and reduce expenditures and subsidies for coastal development.

The alternatives would not result in development of facilities that would adversely impact coastal resources. Therefore no further analysis is required.

4.16 WATER QUALITY

Neither the No Action Alternative nor the Proposed Action Alternative would impact water resources as they would not require the construction of facilities. No further analysis is required.

4.17 WETLANDS

Wetlands include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds. Executive Order 11990, "Protection of Wetlands," compels Federal agencies to avoid, to the extent possible, adverse impacts associated with the destruction or modification of wetlands, and to avoid direct or indirect new construction on wetlands. The alternatives under consideration would not result in the construction of facilities. Therefore, no wetlands impacts are anticipated and no further analysis is required.

4.18 WILD AND SCENIC RIVERS

The Wild and Scenic Rivers Act[10] provides for the protection and preservation of rivers which possess outstandingly remarkable recreational, geologic, fish and wildlife, historic, cultural, and other similar values. No designated National Wild and Scenic Rivers are within the Environmental Study Area. Therefore there would be no impacts to these resources and no further analysis is required.

4.19 FLOODPLAINS AND FLOODWAYS

Executive Order 11988, "Floodplain Management," requires Federal agencies to avoid, to the extent possible, the short and long term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practical alternative. The executive order was issued in furtherance of NEPA, the National Flood Insurance Act of 1968, and the Flood Disaster Protection Act of 1973.

Neither the No Action Alternative nor the Proposed Action Alternative would result in the construction of facilities and there would be no encroachment upon areas designated as a 100-year flood event area as described by the Federal Emergency Management Agency. No further analysis is required.

4.20 HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE

FAA Order 1050.1E requires consideration of actions that involve hazardous materials and solid waste, requiring a pollution prevention plan.[11]

Neither the No Action Alternative nor the Proposed Action Alternative would result in a physical disturbance to the ground or construction debris. As a result, there is no potential to generate or disturb materials identified as being capable of posing an unreasonable risk to health, safety, and property when transported in commerce. This includes hazardous substances[12] and hazardous wastes.[13] Aircraft operational activity is forecast to grow with or without the Proposed Action; therefore no impacts are anticipated with the long-term generation of municipal solid waste. Accordingly, there is no need to address pollution prevention as there are no impacts with regard to this resource category.

4.21 CUMULATIVE IMPACTS

The concept of cumulative impacts addresses the potential for individually minor but collectively significant impacts to

occur over time. Cumulative impact is defined as the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of the agency, Federal or non-Federal, undertaking such actions.[14] The Council on Environmental Quality defines the following types of actions that should be considered in assessing cumulative impacts:[15]

- *Cumulative actions*, when considered with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same NEPA document.

- *Connected actions* are closely related and should be discussed in the same NEPA document. Actions are connected if they meet one or more of the following criteria:

    - Automatically trigger other actions which may require an EIS;

    - Cannot or would not proceed unless other actions are taken previously or simultaneously; and

    - Are interdependent parts of a larger action and depend on the larger action for their justification.

- *Similar actions* have commonalities, such as timing or location, with other reasonably foreseeable or proposed projects that provide a basis for evaluating their environmental impacts in the same NEPA document.

The Proposed Action would not change the basic aircraft flight patterns in the immediate vicinity of any airport. There are no other FAA projects in the Environmental Study Area that would change flight routes, except for a potential Simultaneous Offset Instrument Approach (SOIA) procedure at DTW. The SOIA procedure at DTW would only affect aircraft routings in the immediate vicinity of the Airport. It is not connected to the MASE project. While DTW is progressing with a Part 150 Study, any noise abatement procedures that are proposed as a result of this study would be within the immediate vicinity of the Airport and would be subject to environmental review. There are no airport projects (e.g., new or extended runway) within the Environmental Study Area that would affect flight patterns, except for the CLE Runway 06R/24L extension that has already been incorporated into the noise modeling as discussed in Section 4.1.

As the Proposed Action is the only action being proposed to change flight routes throughout the Environmental Study Area and there is no construction of ground facilities connected to the project, there are no anticipated cumulative impacts.

4.22 OTHER CONSIDERATIONS

The Proposed Action is consistent with applicable state and local plans as they would not have an impact on existing or proposed state and local land use plans and/or development patterns. Moreover, the Proposed Action would reduce non-compatible land uses within the 65 DNL (as measured by the number of people at or above this noise exposure level) as compared to the No Action Alternative.

NOTES

[1] 4 CFR Part 150

[2] FAA Order 1050.1E, Appendix A, Section 14.3

[3] Recodified as 49 USC 303(c).

[4] 16 USC 470.

[5] 36 CFR Part 800.

[6] Bird Strike Committee USA, 2004.

[7] Wildlife strikes to Civil Aircraft in the United States 1990-2004, Federal Aviation Administration and Department of Agriculture, May 2005, Table 8, pp. 20.

[8] 40 CFR 51.853(c)(1).

[9] FAA Order 1050.1E, Appendix A, Section 13

[10] PL 90-542, as amended.

[11] FAA Order 1050.1E, Appendix A, section 10.

[12] Hazardous Substance: any element, compound, mixture, solution, or substance defined as a hazardous substance under the Comprehensive Environmental Response, Compensation, Liability Act and listed in 40 CFR Part 302. If released into the environment, hazardous substances may pose substantial harm to human health or the environment.

[13] Hazardous Waste: under the Resource Conservation and Recovery Act a waste is considered hazardous if it is listed in, or meets the characteristics described in 40 CFR Part 261, including ignitability, corrosivity, reactivity, or extraction procedure toxicity.

[14] 40 CFR 1508.7.

[15] 40 CFR 1508.25.